

CASE REPORTS

A bony bridge within the suprascapular notch. Anatomic study and clinical relevance.

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ABSTRACT: Purpose of the present study was to document the incidence, morphology, origin and clinical significance of the existence of a bony bridge within the suprascapular notch, below the level of the superior transverse scapular ligament. The study was carried out by visual observation on 204 dried scapulas. In only two scapulas (0.98%), there was a bony bridge within the suprascapular notch. The direction of this bony bridge was almost transverse to the notch and as a result there was a bony foramen beneath the bony bridge and a notch above it. There were bony prominences at the superior corners of both suprascapular notches and the bony bridges were both thicker at their attachments and thinner at their middle points, such as a ligament. These bony bridges seem to be the result of the complete ossification of an accessory band of the superior transverse scapular ligament and occur in about 1% of the population. A bony bridge within the suprascapular notch narrowed the notch enough to be considered as a potential risk factor for the suprascapular nerve entrapment syndrome. Radiologists, neurosurgeons and orthopaedic surgeons should keep this abnormality in mind, because they should identify it during the preoperative radiological assessment or intraoperatively, since its existence modifies the surgical technique during open and arthroscopic decompression of the suprascapular nerve.

Key Words: Shoulder, Scapula, Superior transverse scapular ligament, Anatomical variations, Suprascapular nerve entrapment.

INTRODUCTION

The suprascapular notch (SSN) is located at the superior margin of the scapula, just medial to the base of the coracoid process. The superior transverse scapular ligament (STSL) joins the two superior corners of the SSN. The suprascapular nerve (SN) passes beneath the ligament, through the SSN, while the suprascapular artery and vein usually pass above the ligament¹.

Anatomy of the suprascapular region is important for shoulder surgery and especially for arthroscopic SN decompression^{2,3,4}. Kopell and Thompson in 1959 initially described the SN entrapment syndrome at the SSN, which is the main site where entrapment occurs⁵. The existence of a narrow SSN is a well known cause of SN entrapment. A bony bridge within the notch would limit its area.

Review of the literature reveals that there are many studies regarding the presence of a bony bridge that joins the two superior corners of the SSN^{6,7,8,9,10,11,12,13}. This bony bridge is thought to be the outcome of the complete ossification of the STSL. On the other hand, there are only three studies referred to the presence of a bony bridge within the SSN, below the level of the STSL^{9,10,13}. Only one of them paid special attention to this variation¹³. Ticker et al. (1998) noted that this bony bridge is the outcome of the ossification of an accessory STSL band and reached to the conclusion that this variation could be a cause of unsatisfactory SN entrapment postoperative results¹³.

The purpose of this study was to document the incidence, morphology, origin and clinical significance

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Figure 1. Anterior view of the first scapula that was found to have a bony bridge within the suprascapular notch.



Figure 2. Anterior view of the second scapula that was found to have a bony bridge within the suprascapular notch.

of the existence of a bony bridge within the suprascapular notch, below the level of the STSL.

MATERIALS AND METHODS

Two hundred and four dried scapulas were observed in the Department of Anatomy, in the Medical School of the Aristotle University of Thessaloniki, Greece, for the presence of bony bridges within the SSN, below the level of the STSL. On the specimens with this variation observed, the morphology of the SSN and the remaining space of the notch for the passage of the SN was studied. The age, sex, race, sidedness and medical history of the donors were unknown. The possible origin and clinical significance of this variation was determined, based on our findings and the literature review on this topic.

RESULTS

A bony bridge within the SSN was found in two scapulas out of the 204 (0.98%) examined. In particular, in one specimen the bony bridge extended from the middle of the lateral margin of the SSN to the middle of the medial margin of the SSN. The bony bridge was thicker at its attachments and thinner at its middle points, resembling a ligament. There were bony prominences at the superior corners of the SSN, where the STSL inserts. This bony bridge markedly limited the area of the SSN and divided it into a bony foramen inferiorly and a notch superiorly (Figure 1). Regarding the second scapula, the bony bridge extended from the superolateral corner of the SSN to the middle of the medial margin of the notch and it was thicker at its

attachments and thinner at its middle points, resembling a ligament. In this case, there was a sole bony prominence at the superomedial corner of the SSN. This bony bridge also narrowed to a great extent the remaining space of the notch for the passage of the SN and divided the SSN into a bony foramen inferiorly and a notch superiorly as well (Figure 2).

DISCUSSION

A bony bridge within the SSN is a rare anatomical finding. Hrdlicka (1942) found this variation in one out of 2792 dried scapulas observed (0.036%)⁹. Ticker et al. (1998) identified a trifold STSL with complete ossification of its middle band in one out of 79 cadaveric shoulders (1.3%) observed¹³. In this shoulder the SN was found to course beneath the inferior band of the ligament. In another study on 423 dried scapulas, concerning a classification method of the SSN morphology, a bony bridge within the notch was found in three bones (0.7%)¹⁰. In the current study the incidence of the existence of a bony bridge within the SSN was 0.98%, which is approximately the same to that found in two other studies^{10,13}, suggesting that this variation appears in approximately 1% of scapulas.

In both SSN where a bony bridge observed below the level of the STSL, there were bony prominences at the level of the ligament, at both superior corners of the notch. Such bony prominences frequently appear at the attachments of ligaments that cross mobile joints because of applied tensile forces¹⁴. They are called «enthesophytes», a term coming from «enthe-

sis» which is the site of attachment of a ligament or a muscle to a bone and -ophyte, meaning an excrescence or outgrowth¹⁵. Although the STSL does not cross any joint, the loading patterns may reflect either the attachment of muscles and/or the forces transmitted to the STSL from the neighboring coracoclavicular ligament¹⁶.

These bony prominences that we observed, confirm the existence of the STSL between the two superior corners of both notches. Thus, the fact that the bony bridges, which we found within the two SSN, were both thicker at their attachments and thinner at the middle, resembling this way a ligament, led us to the conclusion that these bony bridges may represent an ossified accessory band of the STSL. This conclusion is supported by Ticker et al. (1998)¹³, while there is no comment on the origin of the bony bridges which were described in two other studies^{9,10}.

The most common causes of the SN entrapment syndrome are occupational overuse related to shoulder depression and abduction¹⁷, tumors such as a ganglion cyst¹⁸, a lipoma¹⁹ or other tumors²⁰ and direct trauma to the shoulder region¹⁷. Rengachary et al. (1979) took care of two patients with narrow SSN and SN entrapment syndrome²¹. Additionally, a bifid STSL has been found during a relief operation of SN entrapment²² and an ossified STSL has been found in two patients, members of the same family, who suffered from the SN entrapment syndrome⁷. Thus, the above-mentioned anatomical variations constitute well-known causes of SN entrapment, but their correlation with the SN entrapment syndrome needs further investigation. At any rate, the bony bridges within the SSN which were observed in our study, limited the area of the SSN to a great extent. Thus, in individuals with this variation there is a limited space for the SN to pass through the notch and this is a possible cause of entrapment. Excision of the STSL has been suggested as a therapeutic option and is associated with a high rate of pain relief and functional improvement¹⁷. Recently, arthroscopic decompression of the SN at the SSN has been described with excellent results⁴ while authors emphasized on the importance of related anatomical knowledge^{3,4}.

Cadaveric studies have shown that the SN may pass either above or beneath an accessory band of the STSL, or alternatively may give branches in advance.

In this case one branch is located above and the other beneath this band^{6,13}. This may also occur in a SSN having a bony bridge below the level of the STSL. In individuals having this variation, if the SN or one of its branches lies superior to the bony bridge, there is a high risk of nerve injury against the superior band of the STSL. Rengachary et al. (1979) used the term «sling effect» to describe the mechanism of injury against the sharp inferior border of the STSL due to inadequate size of the SSN¹². On the other hand, if the SN or one of its branches lies inferior to the bony bridge, the surgeon should notice this variation during the preoperative radiological assessment or intraoperatively. The projection in which the SSN is visualized clearly is the anteroposterior projection with the x-ray tube angled 15-30° caudally²³. According to Bhatia et al. (2006), adequacy of decompression should be confirmed intraoperatively by moving the SN out of the notch, taking into account the possible presence of accessory STSL bands as a source of residual entrapment³. Ticker et al. (1998) noted that if the surgeon locates the STSL by palpation, a cause of residual entrapment of one or all of the branches of the SN may remain if there is an accessory band of the STSL¹³. The identification of the bony bridge is very important, because in these cases apart from dissecting the STSL, the bony bridge must be also excised during the procedure, in order to achieve better post-operative results.

In conclusion, a bony bridge within the SSN may be present in about 1% of the population. According to our observations on dried scapulas and the cadaveric findings of Ticker et al. (1998)¹³, this bony bridge seems to be the outcome of the complete ossification of a supernumerary band of the STSL. The bony bridge narrows the SSN enough to be considered as a potential risk factor for the SN entrapment syndrome. Radiologists, neurosurgeons and orthopaedic surgeons should bear this variation in mind, because it is essential to identify it during the preoperative radiological examination or intraoperatively, since its existence alters the surgical technique during open or arthroscopic decompression of the SN.

Οστική γέφυρα μέσα στην ωμοπλατιαία εντομή. Ανατομική μελέτη και κλινικές επιπτώσεις.

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ΠΕΡΙΛΗΨΗ: Σκοπός της παρούσας μελέτης ήταν η μελέτη της συχνότητας, της μορφολογίας, της προέλευσης και των κλινικών επιπτώσεων της ύπαρξης μιας οστικής γέφυρας μέσα στην ωμοπλατιαία εντομή, κάτω από το επίπεδο του άνω εγκάρσιου συνδέσμου της ωμοπλάτης. Για το σκοπό αυτό εξετάστηκαν διακόσιες τέσσερις (204) αποξηραμένες ωμοπλάτες του Εργαστηρίου Περιγραφικής Ανατομικής της Ιατρικής Σχολής του Α.Π.Θ. Μόνο σε δύο ωμοπλάτες (0,98%) παρατηρήθηκε μία οστική γέφυρα μέσα στην ωμοπλατιαία εντομή, με φορά σχεδόν εγκάρσια προς την εντομή, με συνέπεια κάτω από την οστική γέφυρα να αφορίζεται τρήμα, ενώ πάνω από αυτήν σχεδόν φυσιολογική εντομή. Σε όλες τις περιπτώσεις υπήρχαν οστικές προεξοχές στα σημεία πρόσφυσης της άνω δεσμίδας του συνδέσμου και η οστική γέφυρα ήταν παχύτερη στα άκρα και λεπτότερη προς το κέντρο. Έτσι, η οστική γέφυρα φάνηκε ότι ήταν το αποτέλεσμα της οστεοποίησης μίας υπεράριθμης δεσμίδας του άνω εγκάρσιου συνδέσμου της ωμοπλάτης, το οποίο συμβαίνει σε ποσοστό περίπου 1%. Οι οστικές γέφυρες που παρατηρήθηκαν περιόριζαν τις διαστάσεις της ωμοπλατιαίας εντομής σε τέτοιο βαθμό, ώστε να θεωρούνται παράγοντες κινδύνου για παγίδευση του υπερπλάτιου νεύρου. Οι ακτινολόγοι, οι νευροχειρουργοί και οι ορθοπαιδικοί θα πρέπει να γνωρίζουν αυτήν την ανατομική παραλλαγή, καθώς είναι απαραίτητο να αναγνωρίζεται κατά τον προεγχειρητικό ακτινολογικό έλεγχο ή διεγχειρητικά, επειδή η ύπαρξή της τροποποιεί την τεχνική της ανοικτής και της αρθροσκοπικής αποσυμπίεσης του υπερπλάτιου νεύρου.

Λέξεις Κλειδιά: Όμος, Ωμοπλάτη, Άνω εγκάρσιος σύνδεσμος ωμοπλάτης, Ανατομικές παραλλαγές, Παγίδευση υπερπλάτιου νεύρου.

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